

# Sensory analysis of heated sodium alginate film flavored with chicken stock

**Keywords:** non-communicable diseases, fruits, vegetables, chicken, sodium alginate

**Abbreviations:** NCD, non-communicable diseases; WHO, world health Organization; QDA, quantitative descriptive analysis methodology; HSD, honestly significant difference; ANOVA, analysis of variance

## Short communication

The spread of non-communicable diseases (NCD) is considered one of the top health problems worldwide. A low intake of fruits and vegetables in conjunction with a high consumption of foods rich in saturated and trans fats, salt and sugar has been reported to be the main cause of a considerable proportion of deaths associated to NCDs (World Health Organization).<sup>1,2</sup> NCD Global Action Plan 2013–2020 proposes, among other objectives, to reduce the impact of diabetes, giving priority to actions to prevent overweight and obesity.<sup>3</sup> For this reason, interventions aiming at encouraging people to engage in healthier eating habits have been identified as one of the top priorities for reducing the burden of NCD.<sup>4</sup> To assist in the achievement of these objectives, an alternative for roasted chicken skin was proposed in the research carried out by Báez et al.<sup>5</sup> In this work, a heat treated calcium alginate dry film prepared with chicken stock was developed. This film presented similar characteristics to roasted chicken skin when it was heated. Heat treatment of the dry film for 15 min at 130°C produced the development of an opaque maroon color and an increased in their brittleness. This information can be used by product developers, culinary scientists and professional chefs in designing food products in which these kinds of films are employed to wrap or cover the top of chicken meat pieces that are then subjected to cooking. These studies suggest a potential use of heat treated-chicken stock films as a substitute of roasted chicken skin since the crisp texture and optical properties were alike. This is the basis for the preparation of healthier alternatives to the traditional roasted skin through reduction unhealthy components, such as fat (including cholesterol) and carcinogenic compounds, without loss of overall flavor intensity.<sup>5</sup> However, sensory studies are needed before the product can be recommended.

Chicken stock was prepared using 2kg of roasted chicken carcass and a mirepoix consisting of 250g of onion, 150g of carrot, 150g of celery and 150g of leek. All the ingredients were placed in a stock pot and covered with cold water. The mixture was brought to the boil and then, 1g of thyme, 1g of rosemary, 1g of parsley, and 0.8g of black peppercorn were added. After simmered very gently for 6h, the chicken stock was filtered and clarified using egg white. Finally chicken stock was filtered again, aliquoted and stored at -20°C.<sup>5</sup> The preparation of dry films was made according to Báez et al.<sup>5</sup> Solid SA was gently added to chicken stock in order to give a final SA concentration of 0.9 percent (w/v). The mixture was stirred for 12h until homogeneity was obtained. After that, the solution was heated at 60°C, degassed and 88g of it were poured into square plastic Petri dishes of 12cm side. The plates were left to rest at 25°C for 3h and then introduced into an oven for 3h at 50°C. The dry films were withdrawn from Petri

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dishes and stored in plastic containers. These dry films were named Alg-St. Films with physical defects such as air bubbles, holes, and cracks were discarded. The selected films were stored at 25°C and 55 percent RH for 24h until testing. Samples chicken breast at 180°C for 18minutes covered with natural skin and with Alg-St (20mm x 20mm x 30mm) were cooked and served warm (40°C) to panelists. Water was provided for oral rinsing between the samples.

Sensory evaluation of the new product was carried for various attributes namely color, shine, thickness, appearance, aroma, flavor, foreign flavor, crispness, chewiness, adhesiveness and overall palatability. The sensory profile of the two samples was determined according to the quantitative descriptive analysis methodology (QDA) proposed by Stone et al.<sup>6</sup> A trained panel of nine members evaluated the samples for all the previously determined attributes (skin color, shine of skin, thickness of skin, appearance, aroma, flavor, foreign flavor, crispness of skin, chewiness, adhesiveness and overall palatability), using an unstructured scale of 10- point being scored from 1 (least favorable) to 10 (most favorable). Panelists were seated in a room free of noise and odors and suitably illuminated. Data were presented as the arithmetic mean±SEM (Standard Error of the Mean). The results of the QDA were analyzed using analysis of variance (ANOVA), followed by Tukey's honestly significant difference (HSD) test. Significance was accepted at  $p < 0.05$ .

Figure 1A & 1B shows a photograph of both cooked samples. Results of the sensory evaluation are presented in Table 1. No significant differences between the chicken skin and the film were observed in color, appearance, aroma, flavor, foreign flavor, crispness, chewiness and adhesiveness (Table 1) (Figure 2). These similarities would allow the acceptability of the developed product. Moreover, the overall palatability attribute of the film sample obtained the higher score, that is to say, the better sensory evaluation. It was observed that there was a significant difference in the shine maybe due to non-

heated Alg-St luminosity Báez et al.<sup>5</sup> There was also a significant difference in the thickness of natural skin since it contains fat in their structure. It could be possible to increase the thickness of Alg-St by using greater volumes of the casting solution.

It has been shown that a lack of knowledge among consumers regarding innovative and emerging food technologies represents a major barrier to their acceptance.<sup>7</sup> When it comes to advertising and marketing to consumers about new methodologies, campaigns that incorporate improved, convenience, taste and benefit for the consumer could have a positive impact on consumers' choice.<sup>8</sup>

**Table 1** Sensory attributes of chicken breast with skin and with Alg-St. Attribute means $\pm$ SEM for each sample chicken breast with skin and with film in the QDA

Sensory attributes	Chicken with skin	Chicken with film	p-Value
Skin color	5.80 $\pm$ 0.72 <sup>a</sup>	4.89 $\pm$ 1.05 <sup>a</sup>	0.0514
Shine of skin	3.86 $\pm$ 1.11 <sup>a</sup>	5.68 $\pm$ 1.43 <sup>b</sup>	0.0134
Thickness of skin	6.97 $\pm$ 1.18 <sup>b</sup>	2.71 $\pm$ 0.96 <sup>a</sup>	0
Appearance	5.86 $\pm$ 1.90 <sup>a</sup>	6.87 $\pm$ 1.67 <sup>a</sup>	0.264
Aroma	5.10 $\pm$ 1.54 <sup>a</sup>	4.10 $\pm$ 1.66 <sup>a</sup>	0.2328
Flavor	6.22 $\pm$ 0.80 <sup>a</sup>	6.99 $\pm$ 0.86 <sup>a</sup>	0.076
Foreign flavor	1.32 $\pm$ 0.32 <sup>a</sup>	1.46 $\pm$ 0.33 <sup>a</sup>	0.2481
Crispness of skin	3.95 $\pm$ 1.58 <sup>a</sup>	3.38 $\pm$ 1.60 <sup>a</sup>	0.4822
Chewiness	5.71 $\pm$ 0.88 <sup>a</sup>	4.90 $\pm$ 0.60 <sup>a</sup>	0.0663
Adhesiveness	2.00 $\pm$ 0.94 <sup>a</sup>	1.90 $\pm$ 0.83 <sup>a</sup>	0.656
Overall palatability	5.93 $\pm$ 0.84 <sup>a</sup>	7.40 $\pm$ 0.91 <sup>b</sup>	0.0091

Data are expressed as mean $\pm$ SEM. Different letters mean significant differences between samples analyzed by the LSD test ( $P < 0.05$ ).

## Acknowledgments

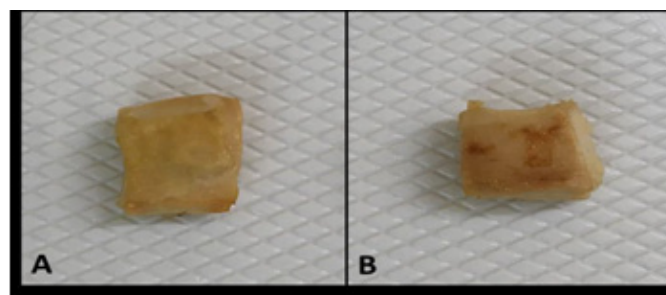
None.

## Conflict of interest

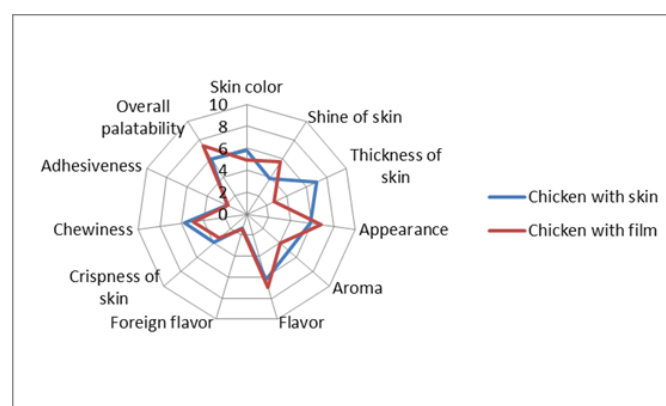
Author declares no conflict of interest.

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**Figure 1** A) Sample of chicken with skin. B) Sample of chicken with film.



**Figure 2** Spider diagrams representation of QDA analysis of chicken breast with skin and with film.

## Conclusion

In conclusion, sensorial characteristics of both cooked products were no different, except in thickness and shine. Moreover, the film presented the higher overall palatability score. These facts make it possible to replace high-fat chicken skin with Alg-St.